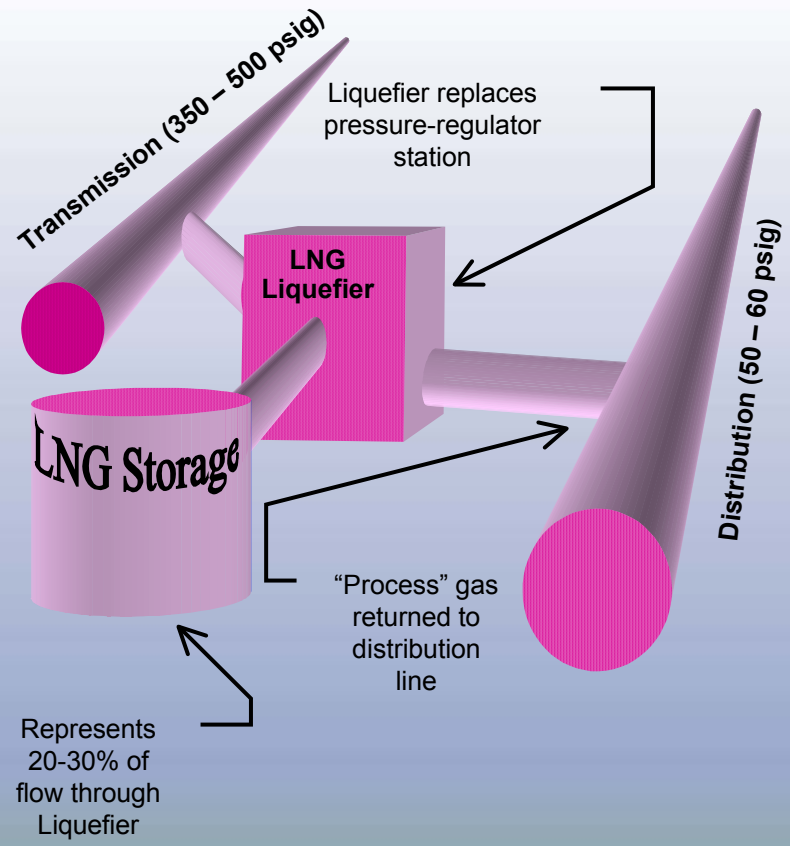
*Idaho National Engineering and Environmental Laboratory*

# *Natural Gas Liquefaction*

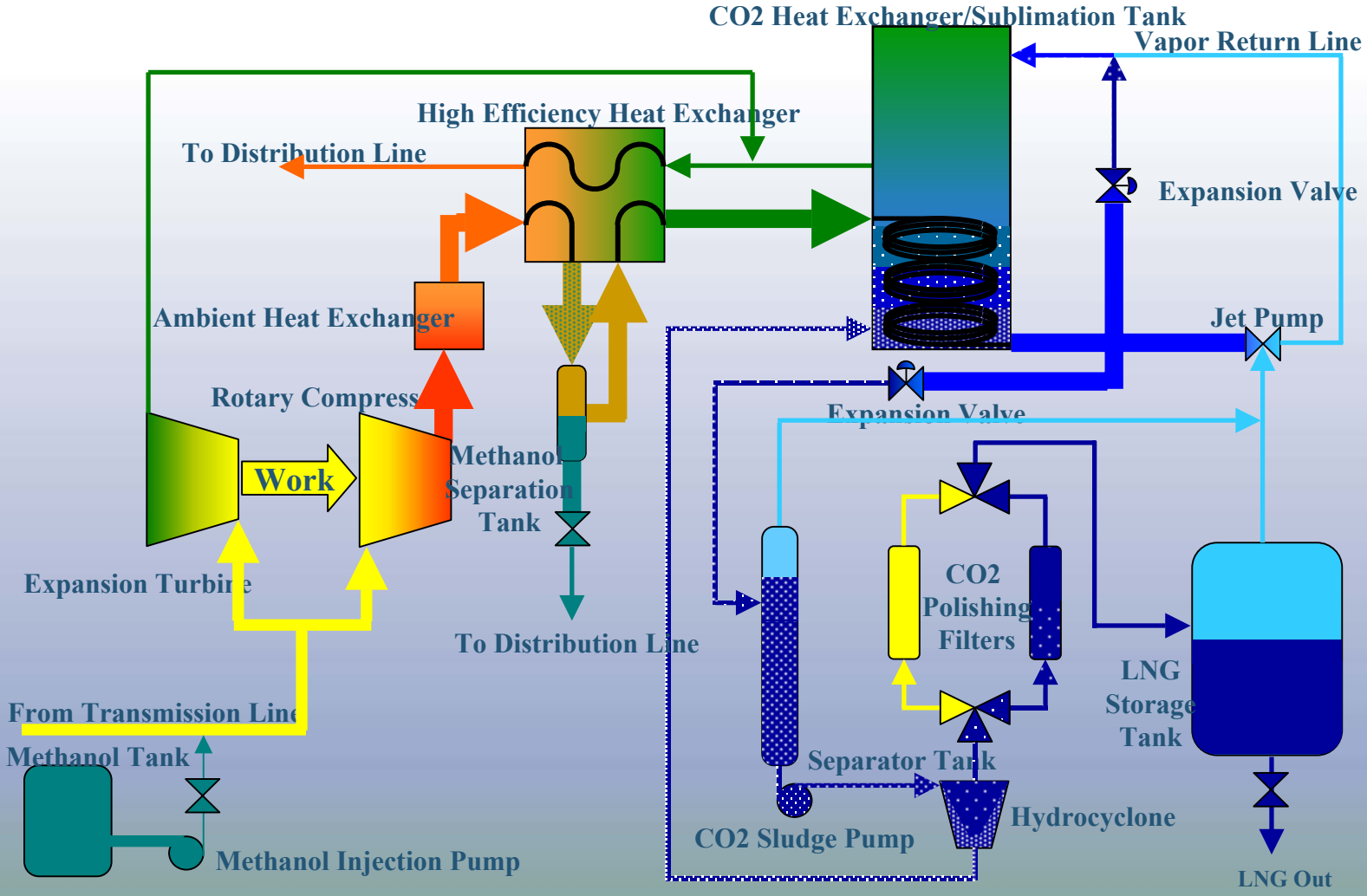
***April, 2004***

# Using the "Energy" in Pipelines

- Pressure letdown from transmission to distribution represents "wasted" energy.
- Energy can be "re-captured" with turbo-expander inserted in place of the pressure-regulator station.
- "Re-captured" energy drives the turbo-expander to create pressure and temperature differentials needed to liquefy a portion of the natural gas stream.
- LNG production efficiency depends on pressure differential, gas composition and total gas throughput.



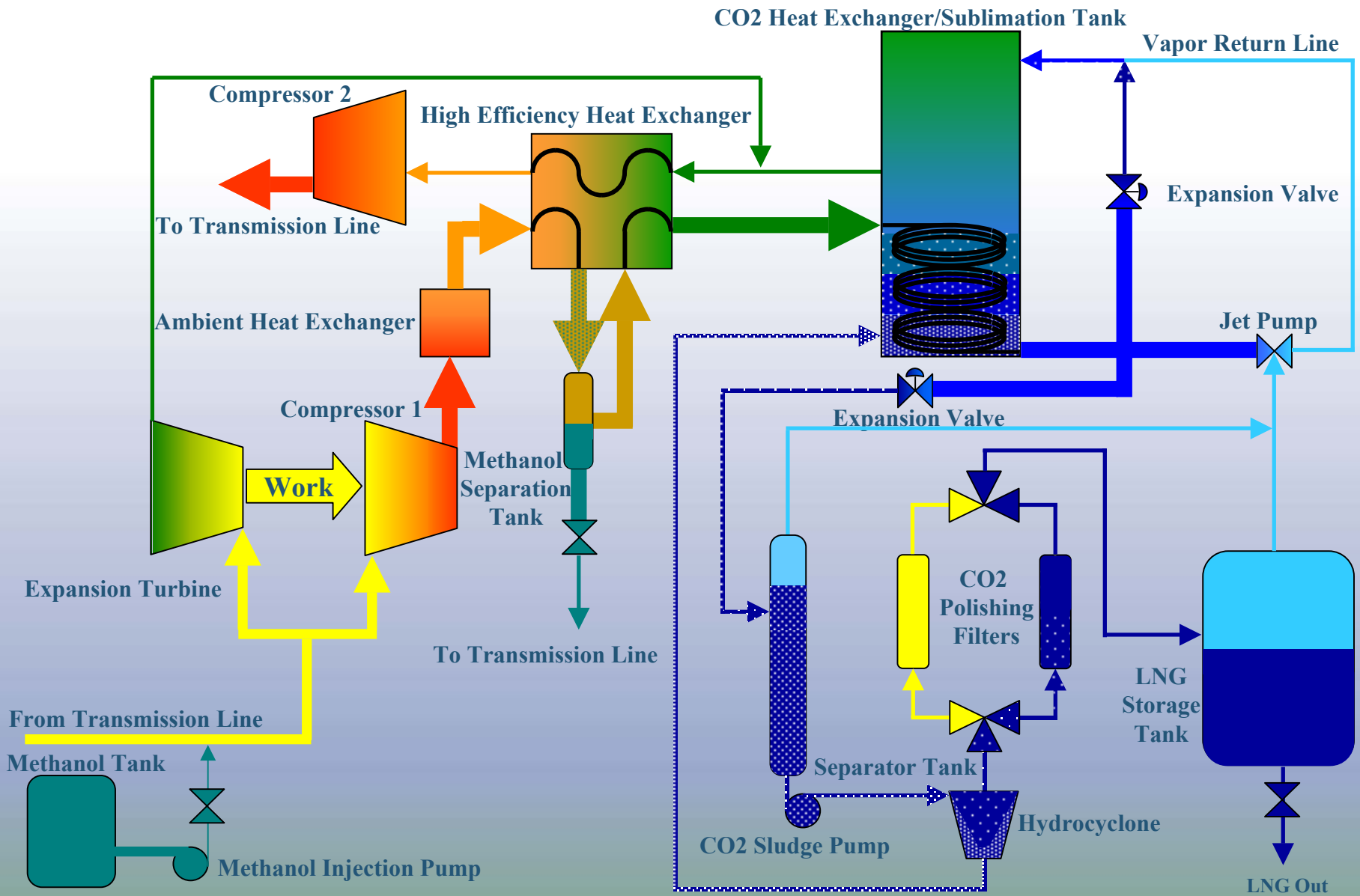
# Small Scale Natural Gas Liquefaction




Clean Fuels

# Small Scale Natural Gas Liquefaction

*Idaho National Engineering and Environmental Laboratory*



# Liquefier Operating Costs

- Methanol for water removal
  - 20,000 1.13 gallons/hr
  - 40,000 2.23 gallons/hr
- Electrical- control system
- Instrument gas TBD
- Human oversight/maintenance TBD
- No natural gas is consumed

# Demo. LNG Price Estimate

- Gas cost/ LNG gal. $0.410
- Liquefaction fee $0.047
- transmission fee/gal. $0.041
- delivery charge/gal. $0.040
- Price/LNG gal. delivered $0.538

- Price/diesel gal. equiv. $1.07
  (With $0.21/dge taxes included)

# Price Competitiveness

| Block Load Prices (LNG gallon equivalents) | | Demo. | Current | |
|---|---|---|---|---|
| | | | High | Low |
| LNG | $ | 0.54 | $0.71 | $0.38 |
| Diesel | -- | | $0.60 | $0.51 |
| LPG | -- | | $0.86 | $0.38 |
| **Fleet Fuel Prices (Diesel gallon equivalents)** | | | | |
| LNG | $ | 1.07 | $1.35 | $0.86 |
| CNG | $ | 1.45 | $1.65 | $1.00 |
| Diesel | -- | | $1.70 | $1.20 |
| LPG | -- | | $1.70 | $0.85 |

# Natural Gas Liquefaction

- *Pressure let-down liquefier– (Sacramento Plant) Utilizes pressure drop between transmission lines and distribution lines to liquefy 10% of gas flow*

- *Compressor based liquefier—(Riverdale Ca.) Connects to a high pressure transmission line and utilizes the pressure drop for liquefaction then uses a compressor to boost the gas that was not liquefied back to transmission line pressure. LNG yield is about 27% of the gas flow.*

- *100% Liquefier—(Seeking partners) 100% liquefier will be used to liquefy gas from a stranded gas well, coal bed, bio-digester or other methane source. 100% of the gas will need to be either liquefied, treated or used as an energy source. R&D will be needed to manage the non methane gases.*

- *Mobile Liquefier—(Seeking partners) The mobile until could be either the compressor based or 100% liquefier that is packaged to reside on a trailer that can be moved as needed to various locations. LNG Storage is anticipated to be contained in LNG tanker trucks.*

**Meter Tube M2, Sac Gas Load Center**
**24" Distribution Line**